UNITED
NATIONS

ST

Secretariat

Distr.
GENERAL

ST/SG/AC.10/C.3/28/Add.3
12 January 1998

Original: ENGLISH

COMMITTEE OF EXPERTS ON THE TRANSPORT OF DANGEROUS GOODS

Sub-Committee of Experts on the Transport of Dangerous Goods

REPORT OF THE SUB-COMMITTEE OF EXPERTS ON ITS FOURTEENTH SESSION (Geneva, 8-18 December 1997)

Addendum 3

Report of the United Nations/ILO Working Group on the Harmonization of the Classification Criteria for Physical Hazards

1 The United Nations/ILO Working Group on the Harmonization of Classification Criteria for Physical Hazards met on 15 and 16 December 1997 under the chairmanship of Mr. G. Oberreuter (Germany).

2 The representatives of the following countries and organizations took part in this session of the Working Group: Australia; Austria; Belgium; Brazil; Bulgaria; Canada; China; Democratic Republic of the Congo; Finland; France; Germany; India; Italy; Japan; Mexico; Morocco; Netherlands; Norway; Poland; Portugal; South Africa; Spain; Sweden; Switzerland; United Kingdom; United States of America; International Labour Office (ILO); European Commission (EC); European Chemical Industry Council (CEFIC); European Industrial Gases Association (EIGA); Federation of European Aerosol Associations (FEA); Hazardous Materials Advisory Council (HMAC).

General

Document: ST/SG/AC.10/C.3/1997/68 (New Zealand)

3 The representative of New Zealand expressed his support for the work on global harmonization and suggested that present proposals for harmonization should be improved by an additional level of hazard below that used for transport, as was done for flammable liquids.

He found it necessary to adequately manage risk for workers, consumers and other non-transport parts of the substances life cycle. In principle, this additional level should be applied to all hazard categories.

4. The Chairman said that the Working Group should keep to its mandate, of developing a harmonized system of classification criteria for physical hazards, and that it should not deal with questions concerning the implementation and subsequent application of this system in regulations.

Explosive properties

Document: ST/SG/AC.10/C.3/1997/54 (Sweden)

5. The representative of Sweden explained that the classification of an explosive varied depending on whether it was packaged or not, and he proposed that two classifications should be envisaged, based on types of packages and handling modes/types of handling.

6. It was recalled that the work of global harmonization consisted in defining explosives according to their intrinsic properties, and that the criteria for explosives were the test series 2 and 3 of Part 1 of the Manual of Tests and Criteria, which applied to the unpackaged product. The secondary classification of packaged products in divisions and compatibility groups was linked to hazard management and communication during carriage and storage while another secondary classification linked to hazard management and communication during the use or handling other than carriage of explosives could be envisaged. However, this question did not depend directly on globally harmonized classification systems.

7. The Chairman said that the harmonization of labelling and hazard communication would be handled by an ILO working group and that the Sub-Committee should contribute to the work.

Addition of a classification pathway identifier to the proper shipping name

Document: ST/SG/AC.10/C.3/1997/67 (New Zealand)
ST/SG/AC.10/C.3/1997/77 (New Zealand)
Informal document: INF.43 (New Zealand)

8. The Working Group considered that New Zealand's proposals concerned hazard communication and not classification.

9. The representative of New Zealand considered that the decisions of the Working Group were not consistent with the scope of the terms of reference determined by the IOMC Coordinating group during its eighth consultation. These terms of reference required the classification scheme developed to be applicable to all classification purposes, whatever the regulatory context may be. In his view the classification criteria, as developed, applied to substances as packaged and did not differentiate the types of hazards that substances with the same packaging may have, and there was no guidance offered on how to classify substances once they were removed from their packaging.

10. The representative of New Zealand considered that his proposals dealt with issues of classification and not of hazard communications, and that they clearly indicated the dual characteristics.

11. No other delegation shared the views expressed by the representative of New Zealand. They felt that the Working Group found other solutions and the result was deemed to be in line with the terms of reference given to it.

Definition of pyrotechnic articles

Document: ST/SG/AC.10/C.3/1997/55 (Germany)

12. Some delegations considered that it was unnecessary to add a definition of pyrotechnic articles, since the definition of explosive articles included articles containing explosives. However, for clarification, the Working Group agreed to add the definition of pyrotechnic articles to the Note to paragraph 3.8.1 (of document ST/SG/AC.10/C.3/26/Add.3) (see annex, note to paragraph 4.7.1).

Organic peroxides: explosive properties

Document: ST/SG/AC.10/C.3/1997/65 (CEFIC)

13. The Working Group considered that the proposal by CEFIC concerned hazard communication and not the harmonization of classification systems. For the types A to G classification of organic peroxides and self-reactive substances and the classification of explosive substances and articles in divisions and compatibility groups, the Working Group considered that it should be pointed out that it only applied to substances and articles as packaged for carriage, on the understanding that this classification could also be used for storage and other purposes as long as the product was kept as packaged for transport.

Test for explosive decomposition of reactive substances due to contamination

Document: ST/SG/AC.10/C.3/1997/87 (New Zealand)

14. The proposal to develop a new criterion to take account of the risk of thermal decomposition due to contamination when substances were no longer protected by the packaging used for their carriage was not adopted since this contamination issue did not depend on the intrinsic properties of the products. The problem raised should be considered in the context of the discussion on hazard communication.

Desensitized explosives

15. Before concluding the discussion on explosive properties, the Chairman suggested that there should be a note mentioning the existence desensitized explosives which, as packaged for carriage, have their explosive properties suppressed.

Organic peroxides
Burning tests for organic peroxide storage classification

Document: ST/SG/AC.10/C.3/1997/49 (Sweden)

16. The Working Group noted that burning tests were used in some countries to classify organic peroxides for storage, but that these tests were not part of the main internationally recognized systems in existence. It was agreed that for the time being there was no need to refer to these tests but that a modification of the globally harmonized system could be envisaged in the future if these tests were harmonized and accepted internationally.

Cut-off (threshold) value for organic peroxides

Document: ST/SG/AC.10/C.3/1997/69 (New Zealand)

17. Evidence was presented to support the need for the 7% limit. The Working Group considered that the reduction of the 7% hydrogen peroxide threshold to 5%, as proposed by New Zealand, for organic peroxides which did not contain more than 2.5 % active oxygen, would not significantly increase safety, and most commercial preparations were already classified on the basis of a 7% threshold. In addition, the expert from France noted that the replacement of chlorine based sterilants deemed to be harmful to the environment should be encouraged. The group retained the 7% threshold.

Test conditions

Documents: ST/SG/AC.10/C.3/1997/64 (United Kingdom)
ST/SG/AC.10/C.3/1997/73, ST/SG/AC.10/C.3/1997/74,
ST/SG/AC.10/C.3/1997/75, ST/SG/AC.10/C.3/1997/76 (New Zealand)
Informal document: INF.34 (CEFIC)

18. The United Kingdom and CEFIC proposed that tests for solids should be carried out on substances as presented for testing; if the substance was to be presented e.g. for carriage or for use in a different form which might alter its behaviour on testing, it should be re-tested. New Zealand, however, proposed to add an additional level of classification by testing at a standard finely divided state to take account of possible modifications of the particle size of the solid during its life cycle.

19. The Working Group preferred the United Kingdom's approach, since a substance submitted for carriage or for use in a form different from that tested would in some cases be liable to constitute a greater hazard which should be represented by the appropriate level of classification. In other cases the testing at a standard finely divided form would not necessarily better represent the intrinsic properties of the substance.

20. The texts adopted can be found in the annex to this report (2.2) The Working Group considered that any possible indication of the physical form in the technical name was a question of hazard communication.

21. The Working Group agreed that its report should clearly state that tests were not required for all possible material forms of a substance. If it was reasonably foreseeable that a substance would considerably change its material form during its lifetime the potential hazards should be taken into consideration. If the risk was likely to increase to the point of altering the classification, the question should be handled by means of calculations, inference or, in exceptional cases, further tests (see paragraph 13 of the United Kingdom's proposal).

22. The representative of Germany said that it would be necessary to improve the test for oxidizing solids and that it would also be useful to make provision for friability criteria. The Working Group considered that these questions were a matter for the Sub-Committee of Experts on the Transport of Dangerous Goods and that delegations prepared to make proposals in those areas should ask the Committee to include these items in the programme of work for the biennium 1999/2000.

Threshold for self-heating substances

Document: ST/SG/AC.10/C.3/1997/86 (New Zealand)

23. The proposal by New Zealand to amend the lower threshold of criteria for self-heating substances and add an additional hazard level for storage was not adopted. Several delegations considered that the present criteria were satisfactory for storage needs and that the proposed simplification lacked a scientific basis.

Solutions of oxidizing or self-reactive solids

Documents: ST/SG/AC.10/C.3/1997/70 (New Zealand)
ST/SG/AC.10/C.3/1997/71 (New Zealand)

24. The proposals by New Zealand received no support. The problems invoked seemed theoretical and could be remedied by appropriate hazard communication provisions.

Flammable liquids

Document: ST/SG/AC.10/C.3/1997/59 (CEPE)
Informal documents: INF.11 (CEPE), INF.46 (CEFIC)

25. It was stated that numerous industrial products such as the paints or organic solvents used to date were more and more being replaced by water-based dilutants. The representative of Sweden mentioned that even if a product contained very small amount of flammable liquid and did not sustain combustion, the vapour could form an explosive atmosphere with air. The Working Group adopted a compromise solution (see annex) on the basis of the proposals by CEPE and CEFIC, enabling liquids which met the flammability criteria but which did not sustain combustion to be exempted from some systems of regulations.

26. It was, however, noted that test L.2 of the Manual of Tests and Criteria was carried out at a temperature of 60.5 °C or 75 °C, and would therefore not be suited to substances having a flashpoint between 60 °C and 93 °C. The Sub-Committee of Experts on the Transport of

Dangerous Goods should be informed of the issue and the delegations with an interest in the problem were invited to propose amendments to test l.2

Flammability criteria for aerosols

Documents: ST/SG/AC.10/C.3/1997/27 (Chairman of the Working Group)
ST/SG/AC.10/C.3/R.764 (United Kingdom)
ST/SG/AC.10/C.3/R.509 (Germany)
ST/SG/AC.10/C.3/1997/37 (United Kingdom)
ST/SG/AC.10/C.3/1997/43 (European Commission)
ST/SG/AC.10/C.3/1997/80 (Norway)
ST/SG/AC.10/C.3/1997/91 (FEA)
Informal documents: INF.33 (United States of America)
INF.41 (France)

27. The Working Group discussed the question of the flammability of aerosols at length. It was difficult to define harmonized criteria as it seemed more important to prepare these criteria in terms of the hazard which these articles constituted than in terms of the intrinsic properties of the substances they contained. The hazard in a situation of aerosol use (in which account should be taken of possible ignition in the event of accidental leakage or deliberate ejection) was different from that arising in a carriage or storage situation (where the product normally remained confined in its receptacle but where account should be taken of possible leakages or accidents or fires affecting large quantities of such articles).

28. It was noted that performance tests existed to determine the flammability of aerosols, for example, the test in the Technical Instructions for the Transport of Dangerous Goods by Air (ICAO) and the test prepared by the Commission of the European Union (see ST/SG/AC.10/C.3/1997/43).

29. As mentioned by the representative of France in document INF.41, a test of this type could be used as a criterion in the context of the use of the products.

30. Provision could therefore be made for considering an aerosol as flammable if it contained any flammable phase (liquid, gas or solid) according to the agreed proposal for criteria.

31. Provision could be made for derogations in a system of regulations for use if the aerosol did not meet the flammability criteria of the performance tests.

32. The representative of the United States said that he hoped that for user purposes provision would be made for an additional level for extremely flammable aerosols (criteria based on a test according to the flame projection method).

33. In the case of regulations concerning carriage and storage, derogation clauses could also be included depending on the nature of the contents (gas, liquid, solid), on the quantity (e.g. low percentage values such as 10% mentioned by Germany or 45% as currently in special provision 63 in the UN Recommendations on the Transport of Dangerous goods) and/or according to performance tests which could be the same as those provided for the user system or which could be

based on other criteria (exposure to heat test or heat of combustion as used in NFPA 30b, for example).

34. The Working Group agreed that the approach described above would be the most appropriate one. However it was not possible to reach a final conclusion for a final proposal, as the various questions raised required careful consideration at national level. The Working Group invited the Sub-Committee of Experts on the Transport of Dangerous Goods to determine the way to follow to conclude the elaboration of a suitable test methodology and a proposal for aerosol flammability.

Corrosivity to metals

Informal document: INF.44 (United States of America)

35. The Working Group adopted the proposal by the United States of America for criteria for substances which are corrosive to metals (see annex, section 4.8).

Revision of the annex to document ST/SG/AC.10/C.3/26/Add.3

36. The Working Group reviewed the annex to the report on its previous session in order to elaborate a new comprehensive proposal for a globally harmonized system of classification of chemicals presenting physical hazards.

37. The Group considered that the column "Uniform Hazard description" in sections 2.1*/, 2.2 */ and 2.3 */ was not necessary, as the description was related to hazard communication and not to classification (see annex, sections 3.1, 3.2 and 3.3).

38. In section 2.1*/, the words "(may be determined)" in the column "Test methods" were deleted (see annex, section 3.1).

39. In section 2.4*/, the words "[self-closing]" were deleted because aerosols fitted with non self-closing release device existed (see annex, section 3.4)

40. In sub-section 3.4.2*/, it was recalled that the criterion for classifying a gas as oxidizing was the fact that its oxidizing potential was greater than that of air. It was agreed to refer to ISO standard 10 156 (Gases and gas mixtures - Determination of fire potential and oxidizing ability for the selection of cylinder valve outlets) for the test methods. It was noted that the latest version of that standard (ISO 10 156:1996) was being revised and that the ISO target date for completion of that revision was 2001. A new table was added accordingly for oxidizing gases in sub-section 3.4.2*/. (see annex , sub-section 4.4.2).

41. The tables for organic peroxides, self-reactive substances and explosives were amended to reflect the decision to indicate that classification under types A to G or subdivisions and compatibility group is applicable when the products are in packaged form.

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*/ *This numbering is that used in ST/SG/AC.10/C.3/26/Add.3. Sections and paragraphs have been renumbered in the annex to this report.*

42. In accordance with the discussions related to desensitized explosives, it was agreed to delete section 3.9*/. Section 3.7*/ (substances related to self-reactive substances) was also deleted, as well as section 3.10*/ concerning substances which, in contact with water, emit toxic or corrosive gases as this matter had first to be discussed, on the basis of proposals, at the level of OECD and the Sub-Committee of Experts on the Transport of Dangerous Goods.

43. Sub-section 3.8.2*/ (Criteria for explosibility) was revised to be presented in the form of a table on the basis of a proposal by the Chairman (INF.39) (see annex, sub-section 4.7.2).

44. The first miscellaneous remarks at the end of the annex was deleted, as a decision had been previously taken on the physical form on which a substance is tested. For the second remark, the Sub-Committee of Experts on the Transport of Dangerous Goods had adopted screening procedures to be included in the Manual of Tests and Criteria as voluntary guidance to minimize the cost of testing products, and the remark was amended to refer to these procedures and transferred to section 2 (see annex, section 2.1)

Conclusion

45. The Working Group adopted in principle a text prepared by the Chairman (INF.38) explaining the status of the work done by the end of 1997 as an introduction to the proposals for a Globally Harmonised System (GHS) for classification criteria and hazard levels for chemicals (substances and mixtures and solutions) presenting physical hazards.

46. The introductory text together with the proposals should be brought to the relevant international bodies concerned.

47. The Working Group invited the Sub-Committee of Experts on the Transport of Dangerous Goods to consider how to deal with future work, i.e.:

- development of proposals concerning hazard communication for contribution to the work of the ILO Working Group on Hazard Communication;
- development of new tests or improvement of existing tests, as indicated in this report (proposals to be made to the Committee for the work programme in 1999/2000);
- consideration of comments;
- development/up-dating of the system pending formal implementation of the GHS.

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**/ This numbering is that used in ST/SG/AC.10/C.3/26/Add.3. Sections and paragraphs have been renumbered in the annex to this report.*

Annex

Proposals for a globally harmonized system of classification of chemicals presenting physical hazards

NOTE 1: *This annex has been prepared by the secretariat on the basis of the results obtained by the Working Group by consensus in 1995, 1996 and 1997 (ST/SG/AC.10/23/Add.4, ST/SG/AC.10/C.3/26/Add.3 and ST/SG/AC.10/C.3/28/Add.2, annex 1).*

NOTE 2: *The term "Manual of Tests and Criteria", wherever it is used in this Annex, means the second revised edition of the United Nations Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria (ST/SG/AC.10/11/Rev.2).*

1. Proposal for definitions of gases, liquids and solids

Definitions	
Definition of gases and gas mixtures (substances, mixtures and solutions with a lower vapour pressure are regarded as liquids)	Vapour pressure at 50 °C > 300 kPa or completely gaseous at 20 °C (at standard pressure of 101.3 kPa)
Definition of liquids (substances not falling under this definition are regarded as solids)	Melting point ≤ 20 °C at 101.3 kPa or for viscous substances without a defined melting point, test according to ASTM D 4359-90 or penetrometer test as prescribed in Annex A.3 of the ADR 1/ with penetrometer according to ISO 2137:1985

1/ *European Agreement concerning the International Carriage of Dangerous Goods by Road (ECE/TRANS/115, United Nations publication Sales No. E.96-VIII-2).*

2. Proposal concerning test conditions

2.1 Screening procedures may be used to determine if full scale testing to assess physical hazard of a substance is necessary

NOTE: *Screening procedures* have been developed by the UN Committee of Experts on the Transport of Dangerous Goods as voluntary guidance to minimize the cost of testing products.*

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*/ *ST/SG/AC.10/C.3/28, annex 2 (subject to endorsement by the Committee at its twentieth session (7-16 December 1998)). After endorsement by the Committee, the screening procedures should be published by the United Nations either as an addendum to the Manual of Tests or Criteria or by incorporation in the third revised edition of the Manual.*

2.2 For classification tests on solid substances, the tests should be performed on the substance as presented. If for example, for the purposes of supply or transport, the same chemical is to be presented in a different physical form which is considered likely to materially alter its performance in a classification test, the substance must be tested also in the new form.

3. Proposals concerning flammability

3.1 Proposal for hazard levels for the classification of flammable liquids

Hazard level	Criteria	Test methods
Very high danger	Initial boiling point ≤ 35 °C and flash point < 23 °C	Closed cup methods to be used, open cup methods only acceptable in special cases
High danger	Flash point < 23 °C and initial boiling point > 35 °C	
Medium danger	Flash point ≥ 23 °C and ≤ 60 °C	
Low danger	Flash point > 60 °C and ≤ 93 °C	

***NOTE 1**: Gas oils, diesel and light heating oils in the flash point range of 55 °C to 75 °C may be regarded as a special group for some regulatory purposes.*

***NOTE 2:** Liquids with a flash point of more than 35 °C may be regarded as non-flammable liquids for some regulatory purposes (e.g. transport) if negative results have been obtained in the combustibility test L.2 of the Manual of Tests and Criteria.*

3.2 Proposal for hazard levels for the classification of flammable solids

Hazard level	Criteria	Test methods
High danger	-	-
Medium danger	Screening test: testing time 2 min (20 min for metal powders) Burning rate test: Substances other than metal powders: wetted zone does not stop fire and burning time < 45 s or burning rate > 2.2 mm/s Metal powders: burning time ≤ 5 min	Method as described in section 33.2.1 of the Manual of Tests and Criteria
Low danger	Method and test as described above Burning rate test Substances other than metal powders: wetted zone stops the fire for at least 4 min and burning rate < 45 s Metal powders : burning time > 5 min and ≤ 10 min	

3.3 Proposal for hazard levels for the classification of flammable gases

Hazard level	Criteria and test methods
High danger	Gases and gas mixtures, which at 20 °C and a standard pressure of 101.3 kPa, (a) are ignitable when in a mixture of 13 % or less by volume in air; or (b) have a flammable range with air of at least 12 percentage points regardless of the lower flammable limit. Flammability should be determined by tests or by calculation in accordance with methods adopted by ISO (see ISO 10156:1996). Where insufficient data are available to use these methods, tests by a comparable method recognized by the competent authority may be used
Medium danger	Gases or gas mixtures, other than those of high danger, which, at 20 °C and a standard pressure of 101.3 kPa, have a flammable range in mixture in air
Low danger	Not applicable

NOTE: Ammonia and methyl bromide may be regarded as special cases for some regulatory purposes.

3.4 Proposal for the definition of aerosols and criteria for their classification

"Aerosols, this means aerosol dispensers, are any non-refillable receptacles made of metal, glass or plastics and containing a gas compressed, liquefied or dissolved under pressure, with or without a liquid, paste or powder, and fitted with a release device allowing the contents to be ejected as solid or liquid particles in suspension in a gas, as a foam, paste or powder or in a liquid state or in a gaseous state."

Criteria for flammability remain to be developed.

4. Proposals concerning reactivity

4.1 Proposal for the definition of pyrophoric substances and criteria for hazard levels for their classification

4.1.1 Definition

Pyrophoric substances are solid or liquid substances which, even in small quantities, are liable to ignite within a short period of time after coming into contact with air.

4.1.2 Criteria for hazard levels

Pyrophoric substances (liquids)		
Hazard level	**Criteria**	**Test methods**
High danger	The liquid ignites in the first part of the test, or if it ignites or chars the filter paper	UN Test N.3 Manual of Tests and Criteria (para. 33.3.1.5.4)
Medium danger	Not applicable	Not applicable
Low danger	Not applicable	Not applicable

Pyrophoric substances (solids)		
Hazard level	**Criteria**	**Test methods**
High danger	The sample ignites in one of the tests.	UN Test N.2 Manual of Tests and Criteria (para. 33.3.1.4.4)
Medium danger	Not applicable	Not applicable
Low danger	Not applicable	Not applicable

4.2 Proposal for the definition of self-heating substances and criteria for hazard levels for their classification

4.2.1 Definition

Self-heating substances are solid or liquid substances other than pyrophoric substances which, in contact with air and without energy supply, are liable to self-heating; these substances will ignite only when in large amounts and after long periods of time

4.2.2 Criteria for hazard levels

Self-heating substances		
Hazard level	**Criteria**	**Test methods**
High danger	Not applicable	Not applicable
Medium danger	Positive result in a test using a 25 mm sample cube at 140 °C	UN Test N. 4 Manual of Tests and Criteria (para. 33.3.1.6.4.3)
Low danger	(a) A positive result is obtained in a test using a 100 mm sample cube at 140 °C and a negative result is obtained in a test using a 25 mm cube sample at 140 °C and the substance is to be packed in packages with a volume of more than 3 m^3; (b) A positive result is obtained in a test using a 100 mm sample cube at 140 °C and a negative result is obtained in a test using a 25 mm cube sample at 140 °C, a positive result is obtained in a test using a 100 mm cube sample at 120 °C and the substance is to be packed in packages with a volume of more than 450 litres; (c) A positive result is obtained in a test using a 100 mm sample cube at 140 °C and a negative result is obtained in a test using a 25 mm cube sample at 140 °C and a positive result is obtained in a test using a 100 mm cube sample at 100 °C	UN Test N. 4 Manual of Tests and Criteria (para. 33.3.1.6.4.4)

4.3 Proposal for the definition of substances which, in contact with water, emit flammable gases, and criteria for hazard levels for their classification

4.3.1 Definition

Substances, which in contact with water, emit flammable gases are solid or liquid substances which, by interaction with water, are liable to become spontaneously flammable or to give off flammable gases in dangerous quantities.

4.3.2 Criteria for hazard levels

Substances which, in contact with water, emit flammable gases		
Hazard level	**Criteria**	**Test methods**
High danger	Any substance which reacts vigorously with water at ambient temperatures and demonstrates generally a tendency for the gas produced to ignite spontaneously, or which reacts readily with water at ambient temperatures such that the rate of evolution of flammable gas is equal to or greater than 10 litres per kilogram of substance over any one minute	UN Test N.5 Manual of Tests and Criteria (para. 33.4.1.4.4.2)
Medium danger	Any substance which reacts readily with water at ambient temperatures such that the maximum rate of evolution of flammable gas is equal to or greater than 20 litres per kilogram of substance per hour, and which does not meet the criteria for high danger	UN Test N.5 Manual of Tests and Criteria (para. 33.4.1.4.4.3)
Low danger	Any substance which reacts slowly with water at ambient temperatures such that the maximum rate of evolution of flammable gas is equal to or greater than 1 litre per kilogram of substance per hour, and which does not meet the criteria for high and medium danger	UN Test N.5 Manual of Tests and Criteria (para. 33.4.1.4.4.4)

4.4 Proposal for the definition of oxidizing substances and criteria for hazards levels for their classification

4.4.1 Definition

Oxidizing substances are

- liquid or solid substances which, while in themselves not necessarily combustible, may, generally by yielding oxygen, cause, or contribute to, the combustion of other material;

- gases which may, generally by providing oxygen, cause, or contribute to, the combustion of other material more than air does.

4.4.2 Criteria for hazard levels

Oxidizing substances (liquids)		
Hazard level	**Criteria**	**Test methods**
High danger	Any substance which, in the 1:1 mixture, by mass, of substance and cellulose tested, spontaneously ignites; or the mean pressure rise time of a 1:1 mixture, by mass, of substance and cellulose is less than that of a 1:1 mixture, by mass, of 50% perchloric acid and cellulose	UN Test O.2 Manual of Tests and Criteria (para. 34.4.2.4.2)
Medium danger	Any substance which, in the 1:1 mixture, by mass, of substance and cellulose tested, exhibits a mean pressure rise time less than or equal to the mean pressure rise time of a 1:1 mixture, by mass, of 40% aqueous sodium chlorate solution and cellulose; and the criteria for high danger are not met	UN Test O.2 Manual of Tests and Criteria (para. 34.4.2.4.2)
Low danger	Any substance which, in the 1:1 mixture, by mass, of substance and cellulose tested, exhibits a mean pressure rise time less than or equal to the mean pressure rise time of a 1:1 mixture, by mass, of 65% aqueous nitric acid and cellulose; and the criteria for high and medium danger are not met	UN Test O.2 Manual of Tests and Criteria (para. 34.4.2.4.2)

Oxidizing substances (solids)		
Hazard level	**Criteria**	**Test methods**
High danger	Any substance which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning time less than the mean burning time of a 3:2 mixture, by mass, of potassium bromate and cellulose	UN Test 0.1 Manual of Tests and Criteria (para. 34.4.1.4.2)
Medium danger	Any substance which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning time equal to or less than the mean burning time of a 2:3 mixture (by mass) of potassium bromate and cellulose and the criteria for high danger are not met	UN Test 0.1 Manual of Tests and Criteria (para. 34.4.1.4.2)
Low danger	Any substance which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning time equal to or less than the mean burning time of a 3:7 mixture (by mass) of potassium bromate and cellulose and the criteria for high and medium danger are not met	UN Test 0.1 Manual of Tests and Criteria (para. 34.4.1.4.2)

Oxidizing substances (gases)	
Criteria	**Test methods**
Any gas which may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does.	ISO 10 156: 1996 (***NOTE**: Improvement of this standard is under consideration by ISO; ISO target date for the revised standard is 2001*).

4.5 Proposal for the definition of organic peroxides and criteria for their classification

4.5.1 Definition

Organic peroxides are liquid or solid organic substances which contain the bivalent -0-0- structure and may be considered derivates of hydrogen peroxide, where one or both of the hydrogen atoms have been replaced by organic radicals.

4.5.2 Criteria for classification

Organic peroxides	
Criteria	**Test methods**
Any organic peroxide, except organic peroxides or organic peroxides formulations: (a) containing not more than 1.0% available oxygen from the organic peroxides when containing not more than 1.0% hydrogen peroxide; or (b) containing not more than 0.5% available oxygen from the organic peroxides when containing more than 1.0% but not more than 7.0% hydrogen peroxide. Organic peroxides in packaged form may be classified under types A to G in accordance with the criteria of the Manual of Tests and Criteria, Part II ***NOTE 1***: *Type G is not dangerous for transport.* ***NOTE 2***: *Sub-divisions may not be necessary for all systems.*	Test series A to H (Refer to Part II of the Manual of Tests and criteria)

4.6 Proposal for the definition of self-reactive substances and criteria for their classification

4.6.1 Definition

Self-reactive substances are thermally unstable liquid or solid substances liable to undergo a strongly exothermic decomposition even without participation of oxygen (air). This definition excludes organic peroxides and substances which are explosive or oxidizing

4.6.2 Criteria for classification

Self-reactive substances	
Criteria	**Test methods**
Criteria of the Manual of Tests and Criteria, Part II. Self-reactive substances in packaged form may be classified under types A to G in accordance with those criteria *NOTE 1: Type G is not dangerous for transport.* *NOTE 2: Sub-divisions may not be necessary for all systems.*	Test series A to H (Refer to Part II of the Manual of Tests and criteria)

4.7 Proposal for the definition of explosives and criteria for their classification

4.7.1 Definition

Solid or liquid substances (or mixtures of substances) which are in themselves capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings, including pyrotechnic substances.

Articles containing one or more explosive substances, except devices containing explosive substances in such quantity or of such a character that their inadvertent or accidental ignition shall not cause any effect external to the device either by projection, fire, smoke, heat or loud noise.

Substances or articles which are manufactured with the view to producing a practical explosive or pyrotechnic effect.

NOTE: *A pyrotechnic substance is a substance or mixture of substances designed to produce an effect by heat, light, sound, gas or smoke or a combination of these as the result of non-detonative self-sustaining exothermic chemical reactions. Pyrotechnic substances are regarded as explosive substances even when they do not evolve gases.*

A pyrotechnic article is an article containing one or more pyrotechnic substances.

4.7.2 Criteria for classification

Explosive substances (liquid or solid) and explosive articles	
Tests and criteria	**Comments**
Explosibility: according to UN Test series 2 (Section 12) 1/ Sensitiveness: according to UN Test series 3 (Section 13)1/ 3/ Thermal stability: according to UN Test 3(c) (Sub-section 13.6.1) 1/	Intentional explosives 2/ are not subject to UN Test series 2 ***NOTE**: Explosive substances in packaged form and articles may be classified under divisions 1.1 to 1.6 and compatibility groups A to S to distinguish technical requirements.*

1/ See: UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria (ST/SG/AC.10/11/Rev.2, United Nations publication, Sales No. E.95.VIII.2).

2/ This comprises substances and articles which are manufactured with a view to producing a practical explosive or pyrotechnic effect.

3/ Explosive substances which do not meet the criteria for impact and or friction sensitivity may be classified as explosives for some regulatory purposes.

***NOTE 1**: The use of the word "explosive" can have different meanings and interpretations. Reference to "an explosive" or "explosives" is commonly understood to mean substances or articles in Class 1 of the scheme of the UN Recommendations on the Transport of Dangerous Goods, that is those which are intentional explosives or have properties which when assessed under the test procedure of the Manual of Tests and Criteria place them in UN Class 1. The description "explosive" can, however, be used to describe a property and as such it encompasses a wider range of substances than just those in UN Class 1. The Global Harmonized System (GHS) requires that classification is based on intrinsic properties and the word 'explosive' in that context can be used to describe the property of a substance i.e. its ability to explode, as well as referring to a substance or article that has been designed to have explosive properties. This can lead to confusion and difficulty but in the above definition "explosive" refers to explosion hazard of substances and articles and is not limited to those which would be placed in Class 1 of the UN scheme.*

***NOTE 2**: Some explosive substances are wetted with water or alcohols or diluted with other substances to suppress their explosives properties (Desensitized explosives) . They may be treated differently from explosive substances for some regulatory purposes.*

4.8 Proposal for criteria for substances which are corrosive to metals

Hazard level	Criteria	Test method
Low danger	Corrosion rate on steel or aluminium surfaces exceeding 6.25 mm a year at a test temperature of 55 °C.	For the purposes of testing steel, type P235 (ISO 9328 (II):1991) or a similar type, and for testing aluminium, non-clad types 7075-T6 or AZ5GU-T6 shall be used. An acceptable test is prescribed in ASTM G31-72 (Reapproved 1990).